CURB COCKS

Necessity of installing, their use and care; advisability and practicability of placing shutoff in the streets, at or near the main, to take care of service leaks outside of the curb line; cost of street boxes, keeping record of them, etc., as compared with curb boxes.

MR. J. M. DIVEN: When the speaker started in the water works business the service shutoffs were all at the main, and about his first work was locating and making records of their location. Later the shutoff boxes were all removed to the curb line, curb cocks being installed. It was at times difficult to locate and clear the shutoff boxes in the street, and it was thought that by putting the shutoff at the curb all troubles would be ended, that even the record of their location would be unnecessary. This proved to be a mistake, as even at the curb there are troubles and records of locations are nearly if not quite as necessary as in the street.

Troubles with leaks between the curb and main have led the speaker to wonder if there might not be some advantages in having the shutoff at the main. It is often necessary to dig up the street to shut off a service at the corporation cock, or to shut off a block or more of main pipe, to make repairs to a leaky service when the leak is outside of the curb cock. A shutoff at the main would obviate this and in many cases save cutting two holes in a pavement, as the one over the leak would be the only one necessary. Shutting down mains is not good policy and should be resorted to as seldom as possible; then too such shutoffs do not please the consumers, who are put to considerable inconvenience and annoyance.

Heavier boxes would be required if located in the street, and the question is whether the cost of extra excavations and the annoyance of shutting off sections of the distribution will offset the additional cost of shutoff boxes located in the street.

MR. OSCAR BULKELEY: The speaker would like to bring up the question of the method of manufacture of lead service pipe. He believes there is no standard of manufacture at present. There is no uniformity in the hardness of pipe that is furnished, and, when put up in reels, the joints that were made when two lengths of pipe were connected in process of manufacture are often found to have been very poorly made, so that the two ends of pipe joined together

in the reels may actually fall apart when subjected to slight bending. It would seem that the lead flange union couplings which are being used to a large extent now require a more uniform quality of lead than the old wiped joint. The speaker believes that standard methods of manufacture should be adopted for lead pipe.

SECRETARY DIVEN: Frequent attempts have been made to get information concerning the manufacture of lead pipe, especially standards as to strength, that is, the heft or class of lead to use for the different sizes, along the lines of the standards for cast iron pipe. We are in the habit of purchasing AA, AAA or even heavier pipe, without any regard to the size, though in the different classes the thickness of wall of pipe is the same for all sizes. It does not seem reasonable that as thick pipe wall is required for a $\frac{5}{8}$-inch pipe as for a 2-inch, but we have no tests or standards to guide us in the purchase of lead pipe. What we need is a standard similar to the one established for cast iron, giving the class of lead to use for different sizes and different pressures. This report or standard could also include standard for quality of metal used, just as the specifications for iron pipe specify the quality of metal.

This question has been brought up with the manufacturers, but they seemed unwilling to go into the matter, and no member of the Association has so far been found to take it up; to make the needed tests and analysis of metal. Most of us are undoubtedly using the wrong classes of pipe, too heavy for small sizes and too light for the large, for we are mostly using the same class in all sizes. The Association will do a good work if it can establish standards to guide users of lead pipe.

MR. M. L. WORRELL: Water pipe cast in 16-foot lengths has recently been put on the market, and the speaker has used some of it and found some economy in its use, about 78 cents per ton in 6-inch pipe, and would like to hear the experiences of others that have used it.

MR. J. M. DIVEN: As the weight of the bell is about 10 per cent of the weight of a length of pipe, there would be a considerable saving in weight of metal bought when longer pipe than the usual standard 12-foot lengths was used. There would also be a considerable saving in lead for joints, with 16-foot lengths there would

be a saving of one joint in every four lengths over 12-foot pipe. This saving is easily figured, both in material and labor, for the different sizes of pipe. In larger sizes the additional weight to handle might be a disadvantage; also, the lines would have to be straighter, as there would be less chance to offset at joints. The speaker can, however, give nothing from personal experience, but trusts that such members as have used the pipe in the new lengths will give their experiences. We all want to save all we can in our construction costs and are keen for any methods of manufacture of material that will assist us in this.

Mr. W. F. Wilcox: The speaker is not a pipe manufacturer, but the company with which he is connected sells a great deal of pig iron to a foundry company. Probably the reason why the length has not been increased is because the smaller foundries have to build the spigot end of the pipe, and over a certain size your specifications require that a certain percentage of the spigot ends may be cut off.

The hardest part of the casting of pipe is to get rid of the honeycombed ends, and with the present methods 12 feet has been established as an economical length. The speaker believes we will save more money by letting the pipe manufacturers work out the pipe lengths for us than we would by attempting to dictate an arbitrary standard. The pipe makers keep a large laboratory and they study their manufactured product day in and day out. The speaker would rather have the opinion of some of the founders as to cast iron pipe than that of all of the testing societies there are. The founders live with the pipe, they know it, they are making the pipe and they know how to make it. They pile up all of their cast iron in different piles and each pile is numbered. A detailed analysis of each pile is carried, and they can tell you if you give them a number of pipe in the large size what mine that ore came out of, the day it was manufactured into pig iron, the day it reached their yard, how they made up that mixture, and the test both for tensile and cross breaking strain. They are anxious for any man that ever buys a foot of pipe to give them the history of any failure there is, and there have been instances where they have spent hundreds of dollars following up a small break simply because there was something in the pipe that, to the minds of pipe manufacturers, indicated that something had got by them in the manufacture of that pipe. The

speaker has seen pipe 36 inches in diameter sent back to the scrap yard after it had been accepted by the inspector in one of the largest cities in the United States.

If you will go to one of those pipe foundries for a week you will find out that they could reduce their percentage of rejections if they would turn over to you the pipe that your inspector is willing to take. The speaker has lived close to a pipe foundry and has been able to see how they study their manufacture. It is wonderful how they make pipe; the care, thought, and endeavor that they put into its manufacture.

Some large cast iron pipes break in the most peculiar manner. The speaker had one break of 17 inches. It was a crack right down on what he calls the belly of the pipe; a little rock not much bigger than the end of one's thumb did that. We used the hammer that the expert hammer men use in breaking up big castings to break that pipe, but could not do anything with the hammer. We put a stick of dynamite on the pipe before we could break it up.

The people who are making pipe are glad to receive any suggestions. It would be well for this convention to go to Birmingham and see how they make the castings and how they are endeavoring to make them the best they know how. They will be glad to have you join with them in making specifications to get the best results in the most economical and practical way. As the manufacturers develop and find that there is demand for a better pipe they will all try to meet the demand. Every man that has been in the water works business twenty-five years will tell you how they used to use wooden pipe in 1820, and the old men in the water works business will tell you how when the new-fangled steel pipe came out the older men said, "Well, we have been laying cast iron pipe a long time and we will let the boys try that new pipe."

Control of a pressure wave in an 18-inch water main 5½ miles long from motor driven turbine pump. When power goes off at power station the pressure drops to 10 feet, and rebounds up to 420 feet, each wave less until pumping against a head of 267 feet with a friction of 32 feet on 299 feet.

MR. W. F. WILCOX: We had an experience with fluctuation of pressure in a 52-inch steel pipe which had a tendency to flatten as the speed of the pump plunger decreased and to assume a circular

shape when the speed of the plunger was at its highest movement. We put on an air chamber which had ten times the diameter of the displacement of the plunger, and ever since that time have had no movement in the pipe. The movement of this pipe was rather peculiar. The general manager sent a message one day to start out on that line and investigate why that pipe was moving two inches. The speaker went out and put pointers on it and set a level on top, and found that the pipe moved $\frac{5}{32}$ of an inch. But after watching it for some time it was found that it was moving an inch and a half. There was a crack right down the back for the entire two miles of the length of the pipe. The engineer with whom the speaker was located had advised anchoring the pipe. We anchored it with concrete anchors. We found the only remedy was to provide an air chamber of ample capacity to take the surges of the pump. We put a check valve at the end of the pipe next to the reservoir and air relief valves to relieve any air that might accumulate in the pipe. It is now five years since that pipe was laid, and we have never had to spend a nickel on it.

Mr. George Hornung: The speaker has had some experience in controlling fluctuating water pressure in pipe lines, one, in particular, a description of which may interest you and also be of some information to you.

This occurred some 15 years ago, when the speaker served a company as general manager of three water works, two of which were being supplied by impounded water collected from a water shed extensive enough to create a lake of considerable dimensions. The main pumping plant was located alongside of this lake and delivered the water to both towns through a single pipe line 20 inches in diameter. The first town reached was one-half mile from the source of supply, and the other 20 miles therefrom. A stand pipe 8 feet in diameter and 140 feet high, was located near the first town and connected with the supply line in common to both towns. At the farthest town the water was received by a circular reservoir 100 feet in diameter and a depth of 12 feet. From this basin, the water was repumped by a second pumping station into a stand pipe 25 feet in diameter and 100 feet high, and connected up in the usual way with the distributing pipe system of the town. It may be well to note that the country is practically level for miles around, and absolutely devoid of any natural elevation for locating either

a reservoir, an elevated tank or a stand pipe; hence, as it was, the maximum amount of water that could be delivered by the pumping station to the farthest town was limited by the carrying capacity of the single line of pipe, and also by the head of water carried in the stand pipe.

It is obvious that under the existing arrangement, the town near the stand pipe would be well supplied with water and pressure, whereas the farthest one, would have its supply greatly restricted. These two plants, arranged as has been explained when the speaker was placed in charge of them, had been operated in that way some 18 years. The speaker soon discovered that the largest and farthest town was not being sufficiently supplied with water, and that the shortage was attributable to the lack of pumping capacity, and also to the carrying capacity of the long supply main and that consequently large expenditures of money would become necessary to give the proper relief, and to bring that about either a duplicate main would have to be put down, or the height of the old stand pipe greatly increased. To do the latter was found to be impracticable and unsafe, and to construct another pipe line would entail an expenditure of at least $250,000.

On an examination of the pipe line in use, it was found that it had ample strength to sustain an additional water pressure of at least 25 pounds over that which was being carried. It was finally concluded to enlarge the pumping facilities at the lake and install an additional pumping engine of 5,000,000 gallons capacity, and to connect it, with the other engines at the station, to a 20-inch pump main so as to by-pass the water around the near town, using the stand pipe and a stretch of the old force main, with a pressure reducing valve properly placed, to supply the latter town. In this way a gravity main was converted into a pump or force main 20 miles long, which, with the higher pumping pressure made use of, furnished the desired amount of water to the second or farthest town.

The question arose with the contractors for a new pumping engine, whether it would be practical to pump directly at the proposed rate through this abnormal length of force main, so as not to burst the pipe by the oscillation of the column of water in such a long line of pipe.

The speaker explained to them how he expected to safeguard this pipe line against any water ram, which would be by the inter-

vention of an air vessel made of riveted steel plate, through which all of the water would be pumped. This air vessel to be located at the pumping plant, and to have a diameter of 5 feet and a height of 30 feet or more; and that a steam driven air compressor would keep the vessel supplied with air down to a point somewhere above the tops of the receiving and discharge nozzles riveted to the base of the vessel. The arrangements as detailed were successfully carried out, and after they were put in operation the expected results were fully realized, and continued so during the speaker's connection with these plants, which ended some four years thereafter.

A recording gauge showed that the terrors of the water ram so commonly accepted and feared by water works operators can be fully controlled and its damaging effects reduced to nil.

Mr. E. E. Davis: We had a 36-inch pipe lying out on a lot for about two months. The keeper of the reservoir called the speaker's attention to a little crack on the end, about 4 inches long, which had passed the inspector. Six months later that pipe was cracked 6 feet, and it just kept on going; it was the only one of forty pieces of pipe that showed any such defect. One of them had a crack that barely showed. That pipe was laid out in the yard and six months afterward split open from atmospheric action.

The speaker had a very peculiar experience with an air chamber. He had the very difficult job of putting a 20-inch main in the bottom of a river. The river bed was composed of rocks. We put in concrete blocks and filled them up with rip-rap on each side so that the water would go over, and turned 90 pounds pressure on and it stood for some time. We reversed on the lower surface and put on 70 pounds. The speaker was called by the keeper of that reservoir who said that the water was all running out of the reservoir. Upon being asked, "Where is it?" He said, "On the 24-inch." Knowing what the trouble was, the speaker went down to examine the 20-inch pipe in the river and when he got there found that a piece had been blown out of the side of the pipe. It was a water ram that caused that. Two men ran away when the speaker came up, and it occurred to him that they had been shooting, and that possibly some wild shot or bullet had struck and burst that pipe; but he could find no mark of where any bullet struck. There was a 6-inch domestic sprinkler near by and the speaker went there to examine it and looked at it very closely. He called to the engineer and

asked him how he got the air in that sprinkler head, and was told that there was a valve cut in the shape of a funnel that fits over the top where the 6-inch pipe comes into the valve. When the water is on from the 6-inch water supply the pressure is about 90 pounds, but the air pressure is only 35 pounds on the sprinkler heads, and the difference in area of the valve that governs the 6-inch opening is sufficient to make up the difference of 55 pounds to the square inch on the contrivance that holds the valve. It was also stated that the valve could not be closed suddenly, but it was found that in trying the sprinkler heads when the air was exhausted it did shut off the sprinkler heads and the water supply very suddenly. The installation of an air chamber was insisted on and after it was installed the trouble ceased.

LEAKY PLUMBING

Enforcing rules concerning leaks in plumbing, by fines, shutting off water or other means.

General discussion of inspection of plumbing and reduction of leaks in unmetered buildings.

MR. JACOB KLEIN:[1] Investigation shows that more than fifty per cent of all waste of water in cities is due to leaky plumbing and to water loss from roof tanks. Leaking toilet tanks are the cause of a large proportion of this loss. Leakage in toilet tanks is not easily discovered, as some types are almost noiseless. Careless management within buildings, especially during periods of extreme temperatures when faucets are allowed to run full in order to draw the water, hot or cold, as required, is also the cause of the loss of a large amount of water.

Owners of buildings when installing their piping should be required to space the hot and cold water lines at least one foot apart. When owners make their application for use of water, they should be required to sign an agreement to prevent all waste of water and wave claims for damage caused by shutting off the supply in case of failure to comply with the notices to repair leaks.

House to house inspection to detect leaks in fixtures and unnecessary use of water in buildings has been found effective.

Inspectors assigned to examine plumbing in buildings should be

[1] Chief Inspector Bureau of Water, New York City.